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REV 10/04

BIT LABELING FOR AMPLITUDE
PHASE SHIFT CONSTELLATION USED WITH
LOW DENSITY PARITY CHECK (LDPC) CODES

RELATED APPLICATIONS

|01| This application is related to, and claims the benefit of the earlier filing date under 35

U.S.C. § 119(e) of, U.S. Provisional Patent Application (Serial No. 60/393,457) filed July 3,

2002 (Attorney Docket: PD-202095), entitled "Code Design and Implementation Improvements

for Low Density Parity Check Codes," U.S. Provisional Patent Application (Serial No.

60/398,760) filed July 26, 2002 (Attorney Docket: PD-202101), entitled "Code Design and

Implementation Improvements for Low Density Parity Check Codes," U.S. Provisional Patent

Application (Serial No. 60/403,812) filed August 15, 2002 (Attorney Docket: PD-202105),

entitled "Power and Bandwidth Efficient Modulation and Coding Scheme for Direct Broadcast

Satellite and Broadcast Satellite Communications," U.S. Provisional Patent Application (Serial

No. 60/421,505), filed October 25, 2002 (Attorney Docket: PD-202101), entitled "Method and

System for Generating Low Density Parity Check Codes," U.S. Provisional Patent Application

(Serial No. 60/421,999), filed October 29, 2002 (Attorney Docket: PD-202105), entitled

"Satellite Communication System Utilizing Low Density Parity Check Codes," U.S. Provisional

Patent Application (Serial No. 60/423,710), filed November 4, 2002 (Attorney Docket: PD-

202101), entitled "Code Design and Implementation Improvements for Low Density Parity

Check Codes," U.S. Provisional Patent Application (Serial No. 60/440,199) filed January 15,

2003 (Attorney Docket: PD-203009), entitled "A Novel Solution to Routing Problem in Low

Density Parity Check Decoders," U.S. Provisional Patent Application (Serial No. 60/447,641)

filed February 14, 2003 (Attorney Docket: PD-203016), entitled "Low Density Parity Check

Code Encoder Design," U.S. Provisional Patent Application (Serial No. 60/456,220) filed March

20, 2003 (Attorney Docket: PD-203021), entitled "Description LDPC and BCH Encoders," U.S.

(Serial No. 60/469356)

Provisional Patent Application filed May 9, 2003 (Attorney Docket: PD-203030), entitled

(Serial No. 60/482112)

"Description LDPC and BCH Encoders," U.S. Provisional Patent Application filed June 24,

2003 (Attorney Docket: PD-203044), entitled "Description LDPC and BCH Encoders," and U.S.

(Serial No. 60/482/07)

Provisional Patent Application filed June 24, 2003 (Attorney Docket: PD-203059), entitled

"Description LDPC and BCH Encoders"; the entireties of which are incorporated herein by

reference.

FIELD OF THE INVENTION

[02]　The present invention relates to communication systems, and more particularly to coded

systems.

BACKGROUND OF THE INVENTION

[03]　Communication systems employ coding to ensure reliable communication across noisy

communication channels. These communication channels exhibit a fixed capacity that can be

expressed in terms of bits per symbol at certain signal to noise ratio (SNR), defining a theoretical

upper limit (known as the Shannon limit). As a result, coding design has aimed to achieve rates

approaching this Shannon limit. Conventional coded communication systems have separately

treated the processes of coding and modulation. Moreover, little attention has been paid to

labeling of signal constellations.

[04]　A signal constellation provides a set of possible symbols that are to be transmitted,

whereby the symbols correspond to codewords output from an encoder. One choice of

constellation labeling involves Gray-code labeling. With Gray-code labeling, neighboring signal

points differ in exactly one bit position. The prevailing conventional view of modulation dictates

that any reasonable labeling scheme can be utilized, which in part is responsible for the paucity

of research in this area.

[05]　With respect to coding, one class of codes that approach the Shannon limit is Low

Density Parity Check (LDPC) codes. Traditionally, LDPC codes have not been widely deployed

because of a number of drawbacks. One drawback is that the LDPC encoding technique is highly

complex. Encoding an LDPC code using its generator matrix would require storing a very large,

non-sparse matrix. Additionally, LDPC codes require large blocks to be effective; consequently,

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